Value-driven policy-making as a socio-cognitive technical system

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1. Motivation

*"Britain's water policits are **relatively benign**. Not so in many other parts of a densely populated world, where the availability of clean, potable water, and water for agricultural and industrial use is a **hot political, security and economic issue** – as well as a frequently unmet, basic human need [...] for some, it is a **cause for war**".*

The Observer
July 8 2018 [1]

Grand Ethiopian Renaissance Dam

- Ethiopia: prestige project, symbolising and facilitating the country's development.
- Sudan: stability, cheap energy and reliable water supply
- Egypt: major threat

1. Motivation

- **Public policy and ethics**
  - Conciliate legitimate conflicting stakeholders' values.
  - Agree upon a better future state of the world and the means to achieve it.
  - Consequently, stakeholders commit to contribute towards the values embedded in the policy.
- **Ethics and AI**
  - Policy-design as an example of value-driven action.
    - Acting according to values
    - Foster values in a social system
  - Value-driven simulation as a tool for value-based agreements.
  - A contribution towards value-alignment AI challenge.

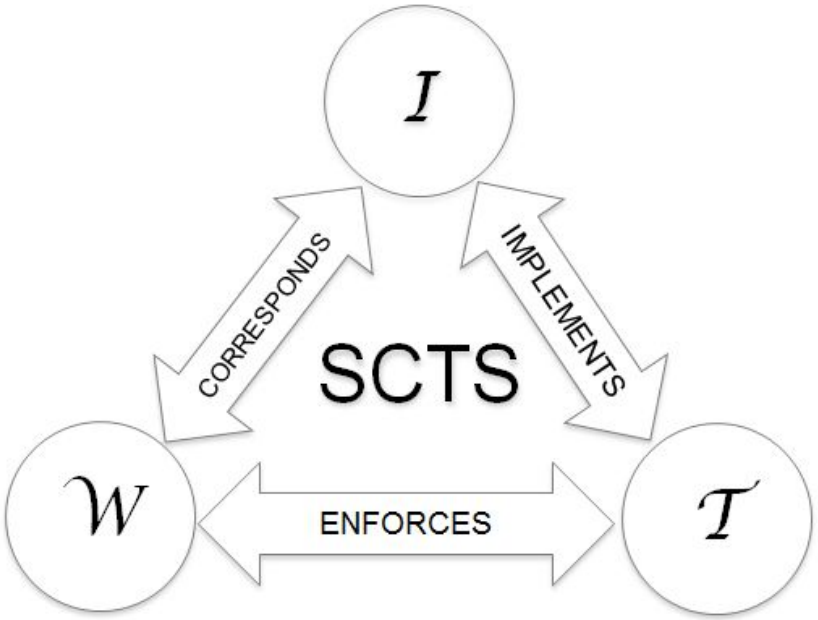
2. Background

- **(1) Values:**
  - Agents' *rationalities* are supported by **mind-frames**, that involve *values and other constructs*
  - These enable them to ***assess*** *the state of the world* and to ***decide*** *on their actions*.
  - Consequentalism.
- **(2) Policy-making:**
  - Choose means to achieve a *better* end state of the world.
  - Choices entail trade-offs (and different equilibria).
  - Choices depend on the **values** of policy-makers.
- **(3) ABS:**
  - Individual behaviour leads to emergent macro-behaviour.

2. Background

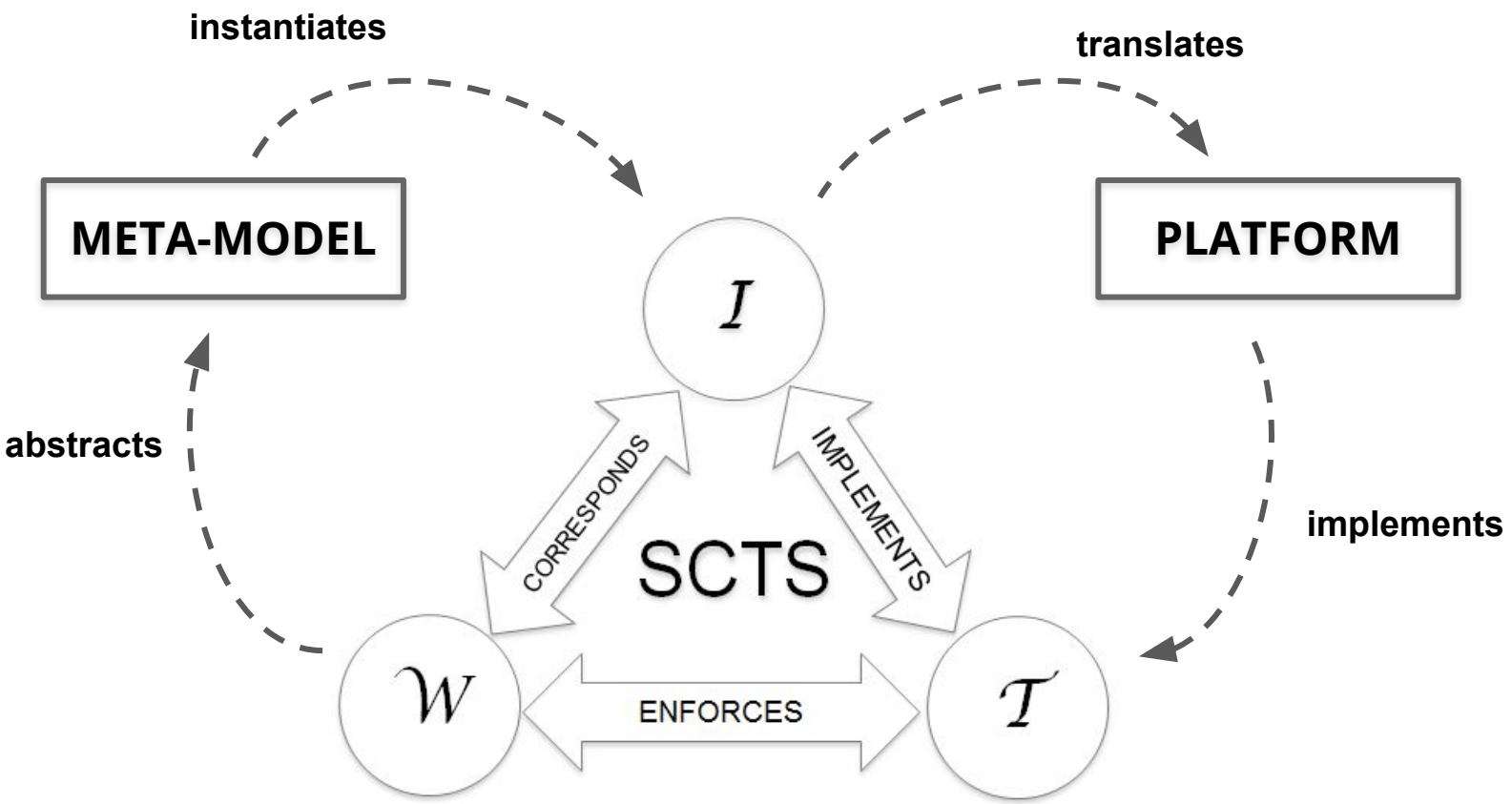
- **(4) Socio-cognitive technical systems**
  - **Agents:**
    - Autonomous
    - Heterogeneous
    - Opaque
    - Socio-cognitive rationality
  - **Social space:**
    - Open regulated MAS
    - Situated
    - Shared state (admissible agent actions and events).

2. Background

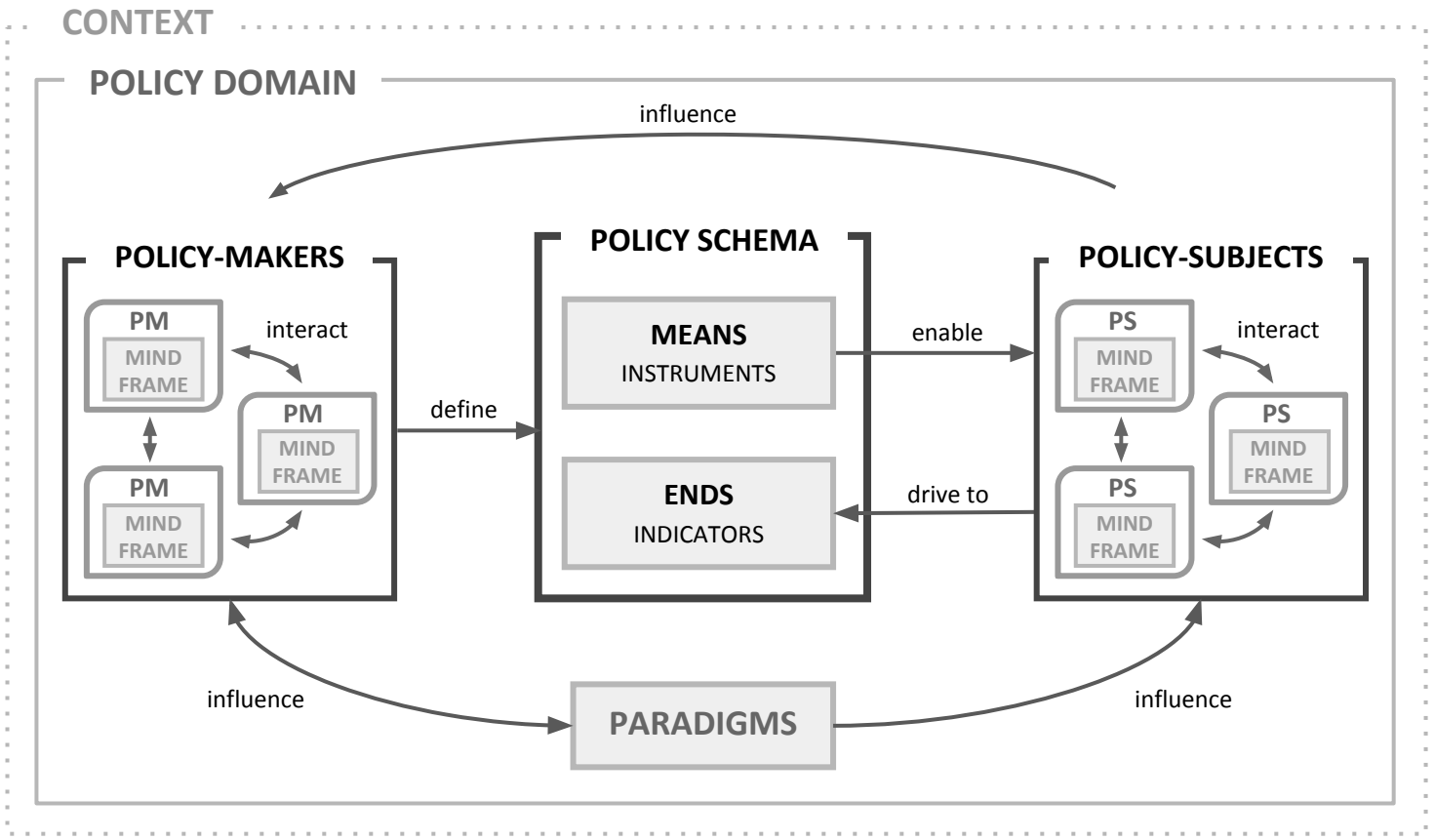


[4]

2. Background

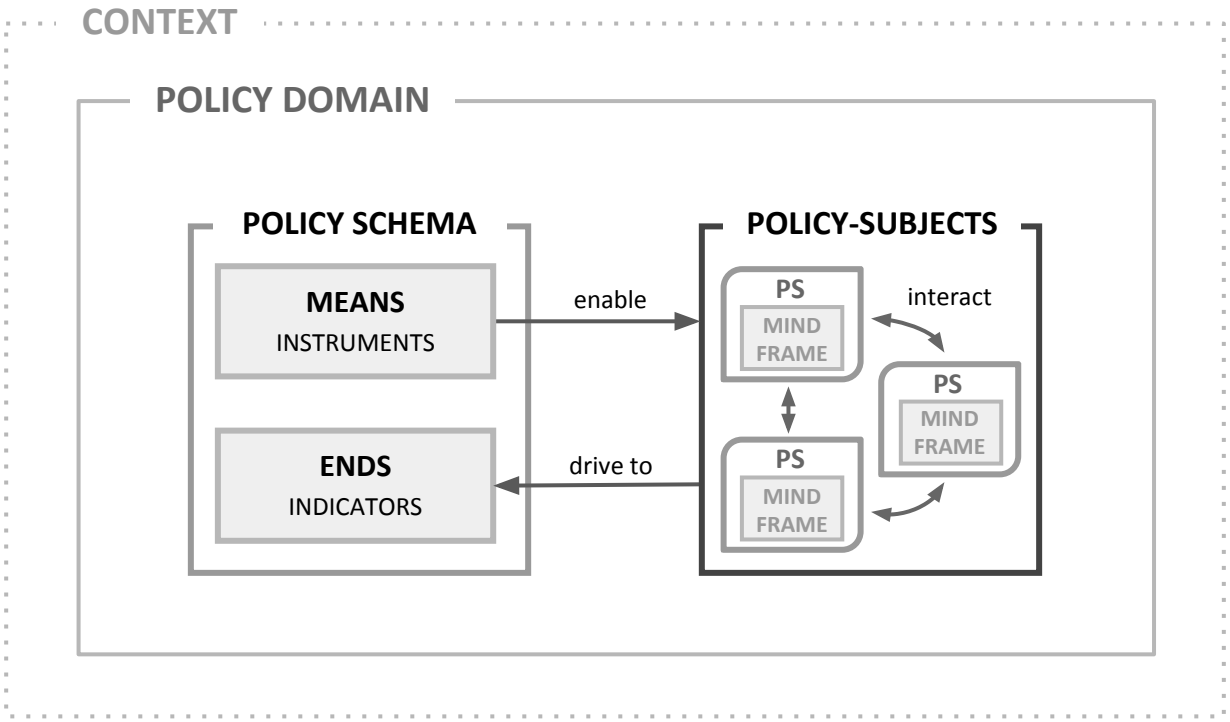


3. Conceptual model



3. Conceptual model

- **Simulation model:**



3. Conceptual model

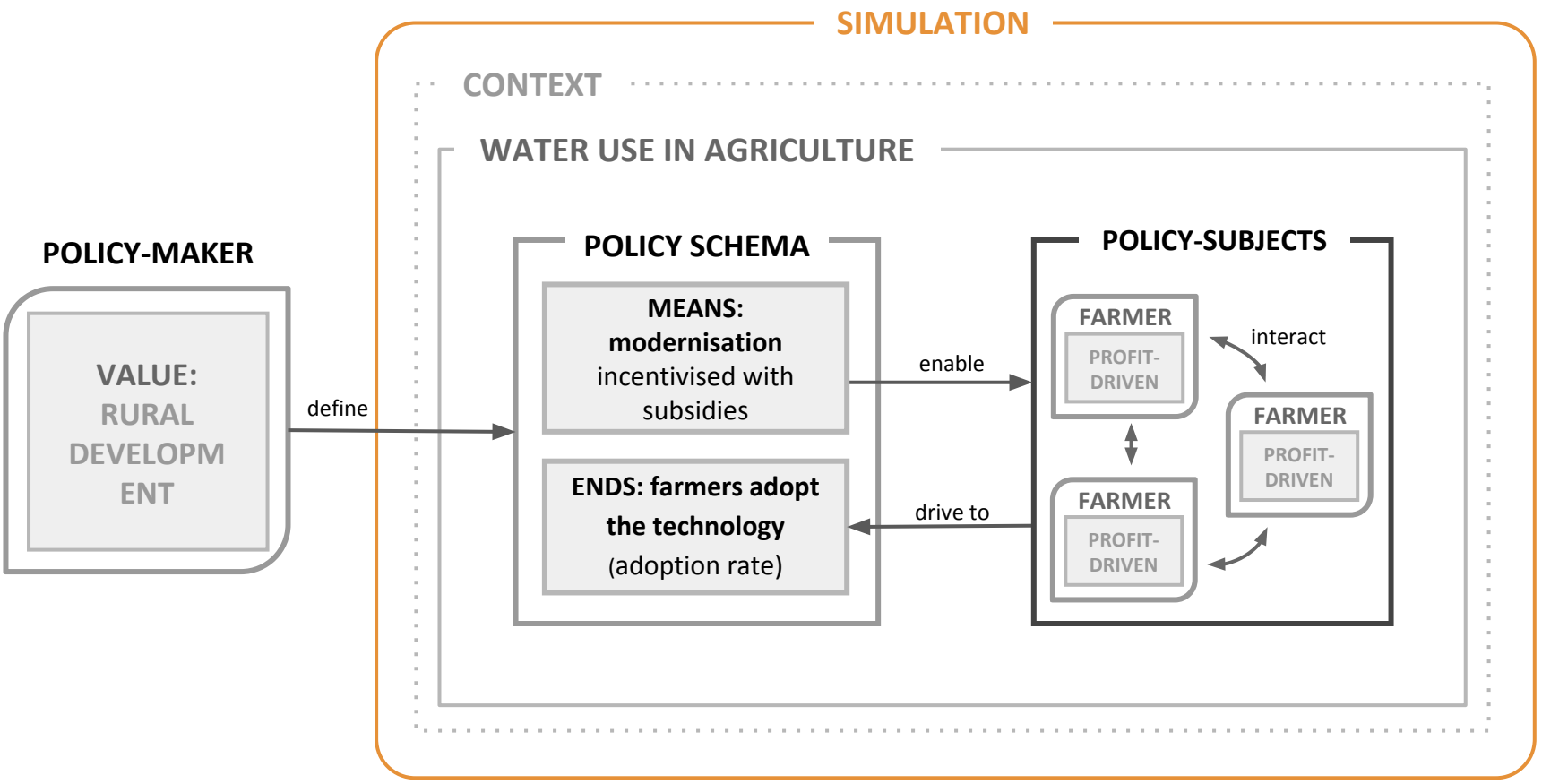
- **Policy schema:**
  - **Policy means:**
    - They aim at producing behavioural changes on policy-subjects.
    - Expressed as *instruments* (norms, incentives,...):
      - Afforded actions
      - Regulate actions
      - Persuade agents
  - **Policy ends:**
    - They define desirable states intended to be achieved.
    - Expressed as *indicators* to evaluate the evolving state of the world.

3. Conceptual model

- **Towards a metamodel for value-driven policy simulation:**
  - **Roles:**
    - Policy-makers (factions like government agencies, associations, NGOs,...)
    - Policy-subjects (eg, farmer, farmer communities, RBA, utilities,...)
  - **Information structures:**
    - State of the world
    - Policy schema
      - Means (instruments)
      - Ends (indicators)
    - Domain language (to describe $\mathcal{W}$)
    - Action language
    - Normative language
  - **Subcontexts:**
    - Agenda setting
    - Definition
    - Negotiation
    - Enactment
    - Monitoring

4. Examples

- **Example # 1:** Modernisation of farmers



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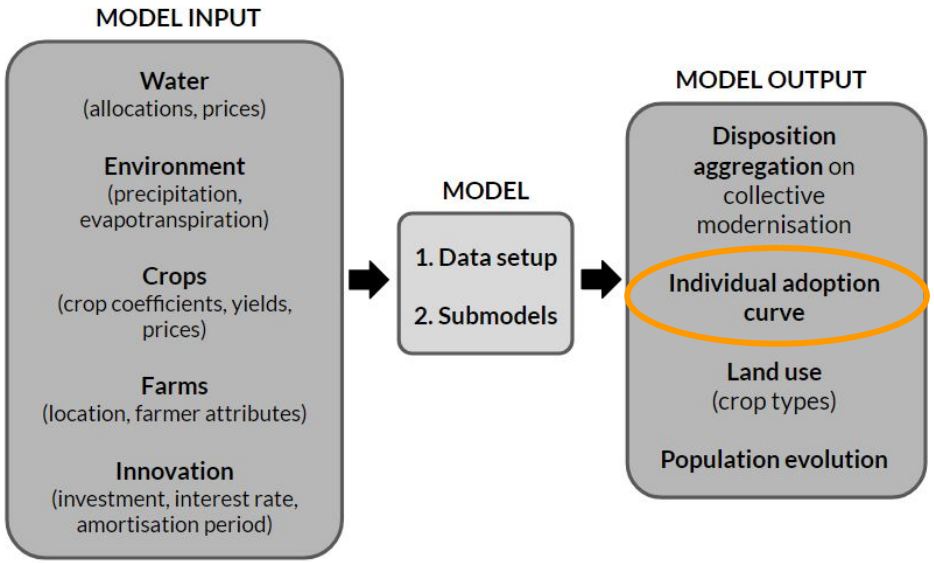
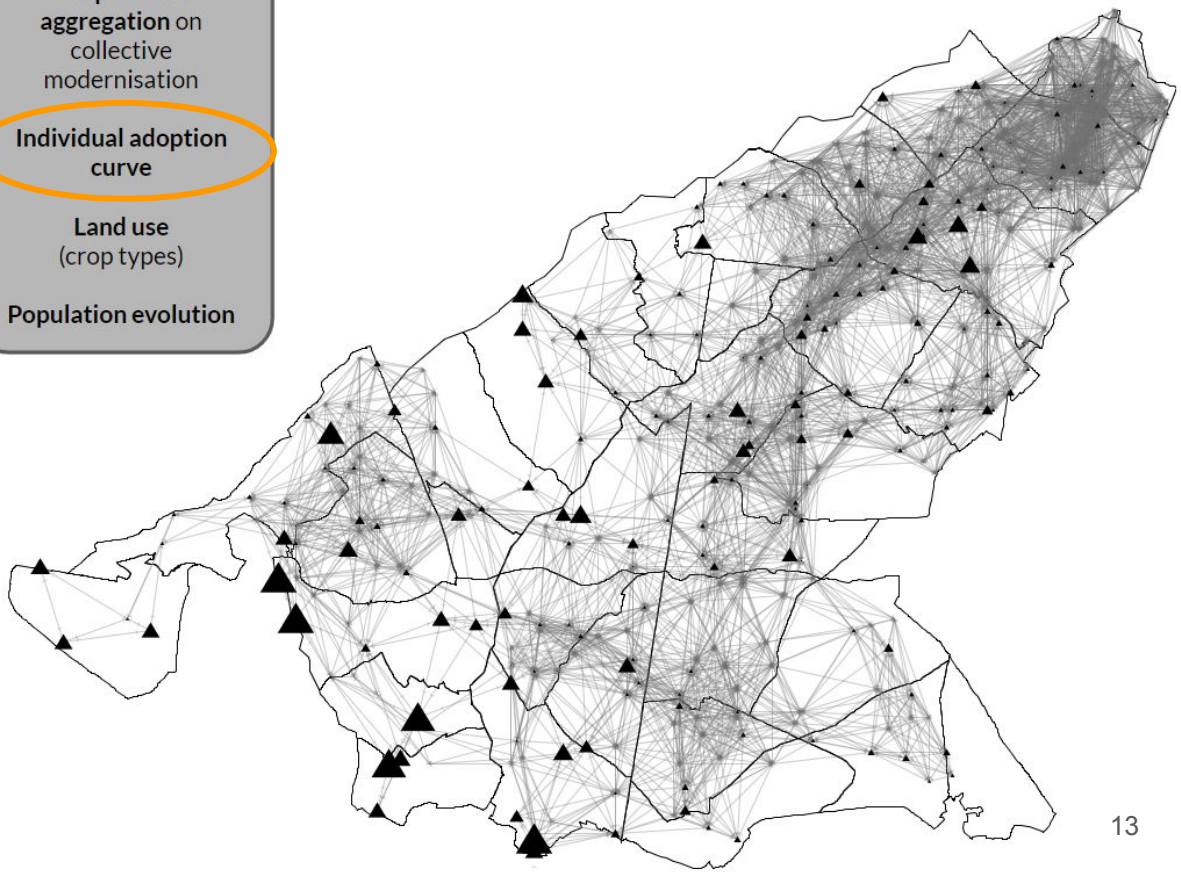
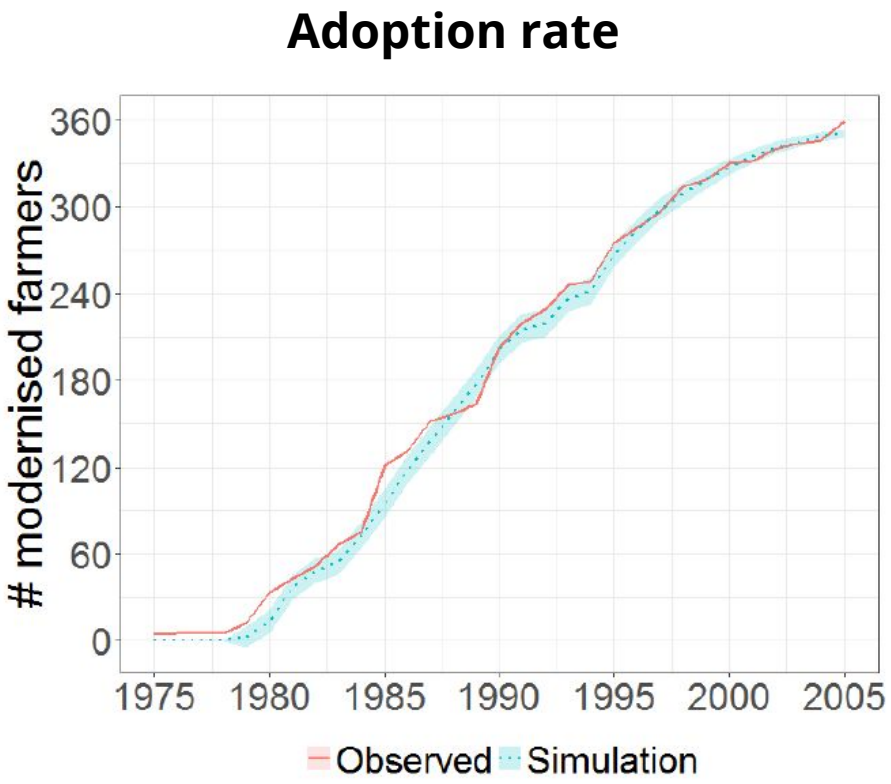




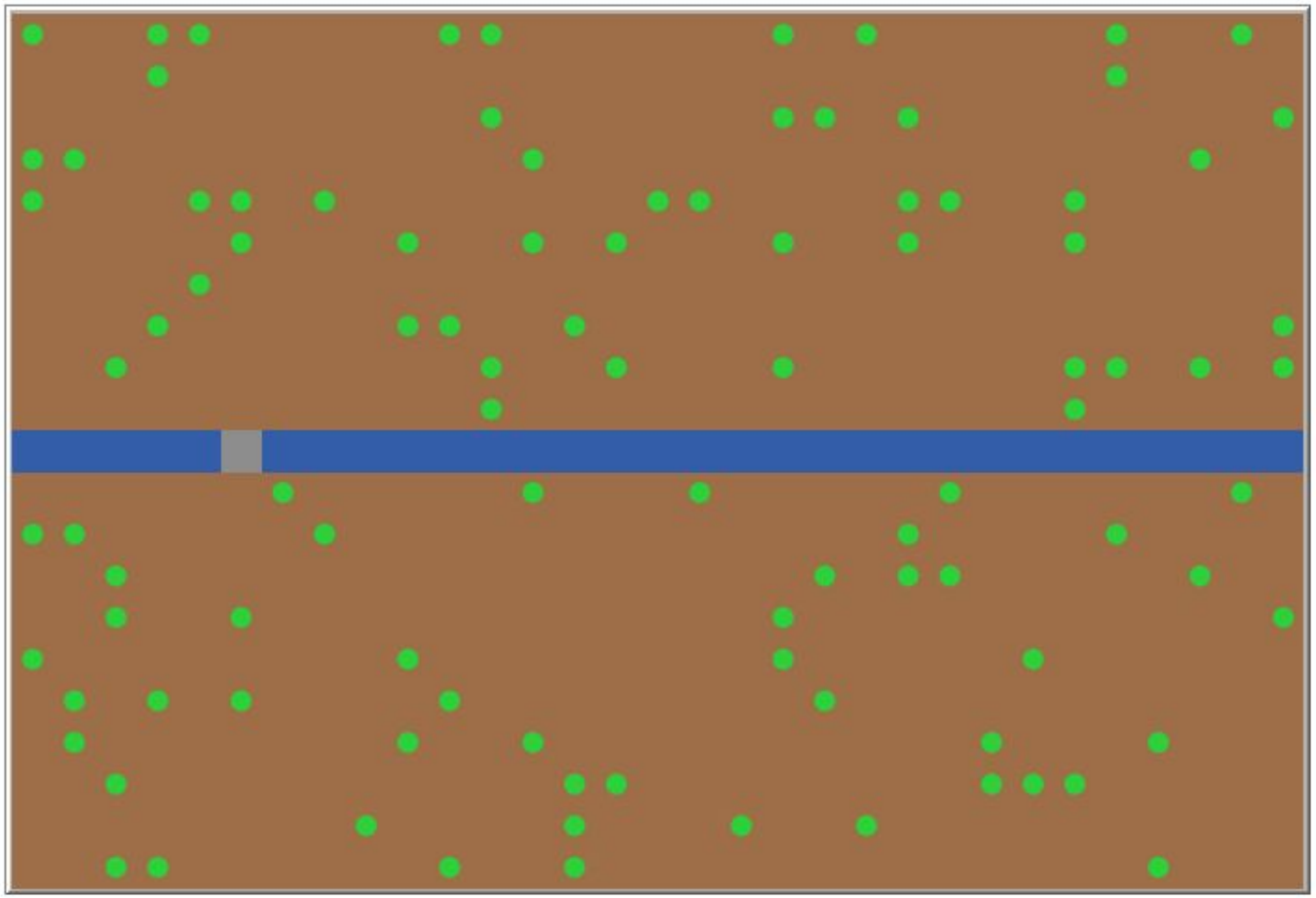
4. Examples

- **Example # 1:** Evolving state of the world



4. Examples

- **Example #2:** simplistic model with PM's values interplay



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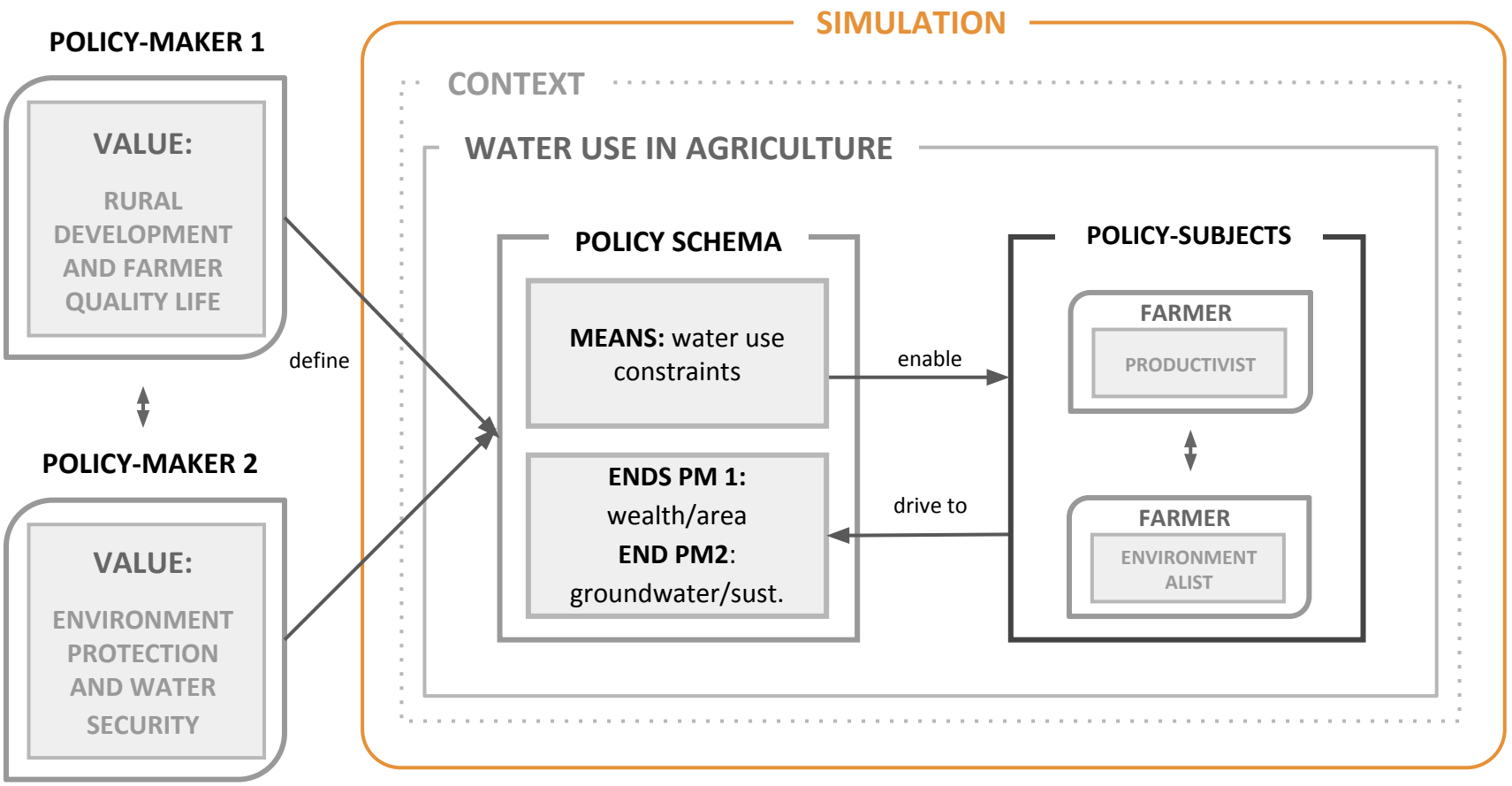


4. Examples

- **Example #2:** simplistic model with PM's values interplay

	Policy schema P1	Policy schema P2
Values	Rural development Farmer quality life	Environmental protection Water security
Means: • **SW use constraint (m^3/ha)**	2 500	2 500
• **GW use constraint (m^3/ha)**	3 500	1 000
Ends: • **Indicators**	Cultivated area (ha) Wealth (eur/hab)	GW resources (hm^3) GW Exploitation (%)

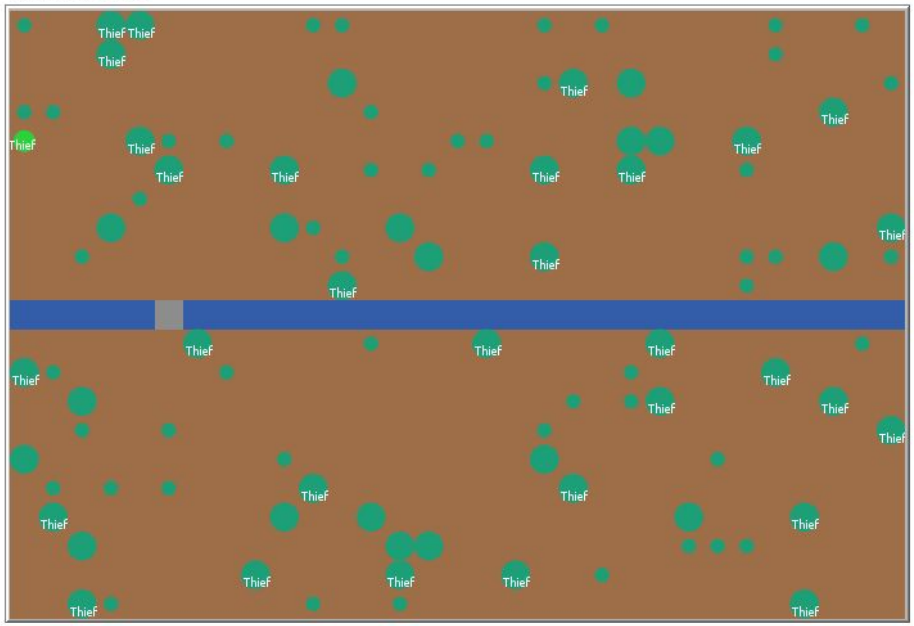
4. Examples

- **Example #2:** simplistic model with PM's values interplay

	Policy-subject 1	Policy-subject 2
Values	Autonomy Productivity Power	Environmental protection Autonomy Fairness Efficiency
Actions	Withdraw1 Irrigate Sell Modernise1 Expand	Withdraw2 Irrigate Sell Modernise2
Ends	Water Demand fulfilment Production Wealth	Water Demand fulfilment Groundwater exploitation Neighbouring lawbreakers

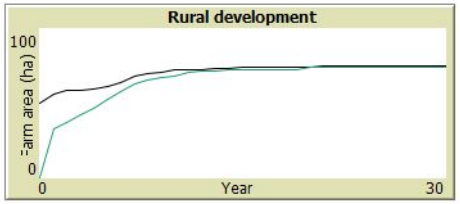
4. Examples

SIMULATED SPACE:

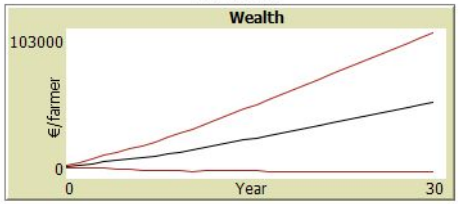


POLICY SCHEMA 1

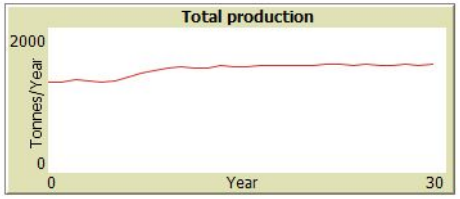
V: Rural development



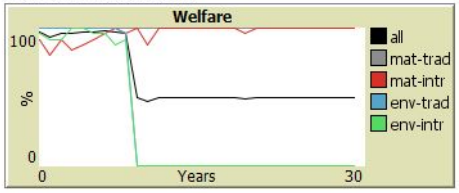
V: Life quality



V: Food security

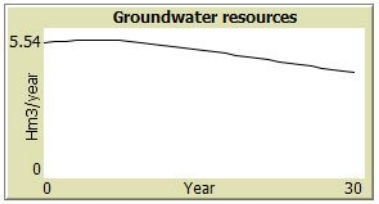


Policy subjects monitoring:

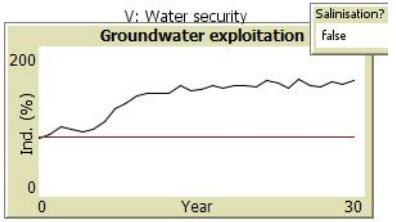


POLICY SCHEMA 2

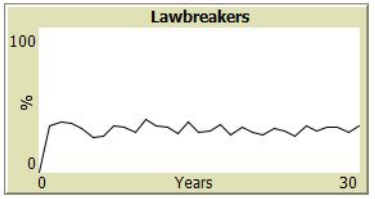
V: Environmental protection

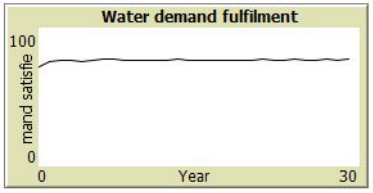


V: Water security



V: Fairness





4. Examples

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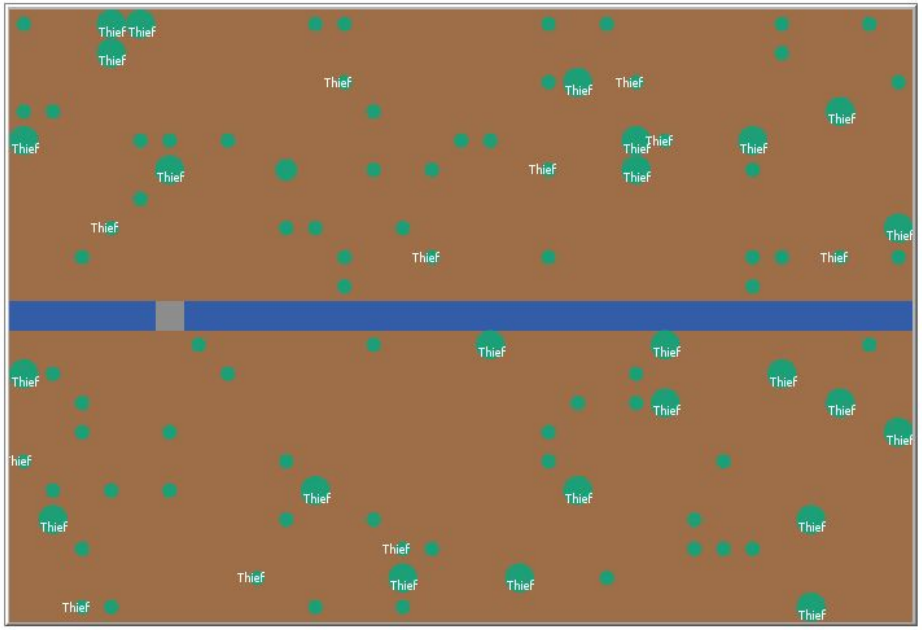

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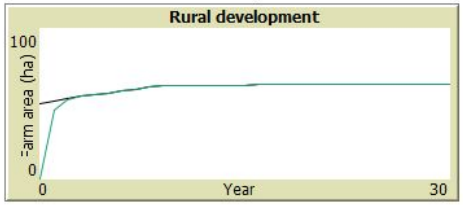

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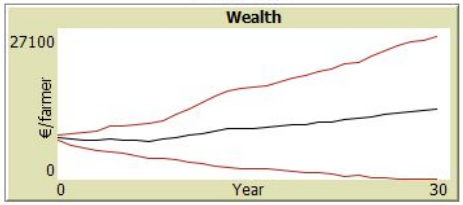

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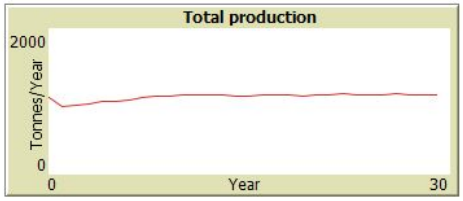

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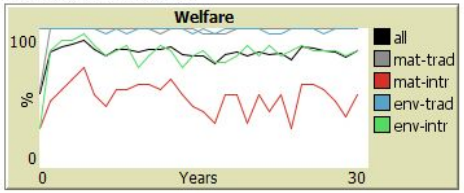

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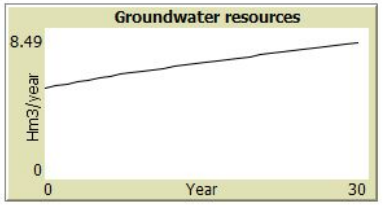

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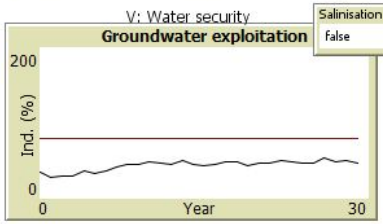

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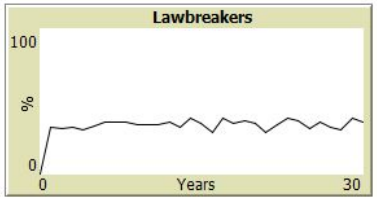
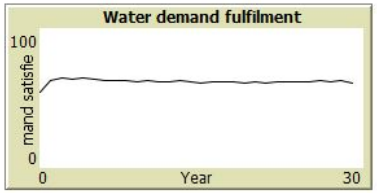
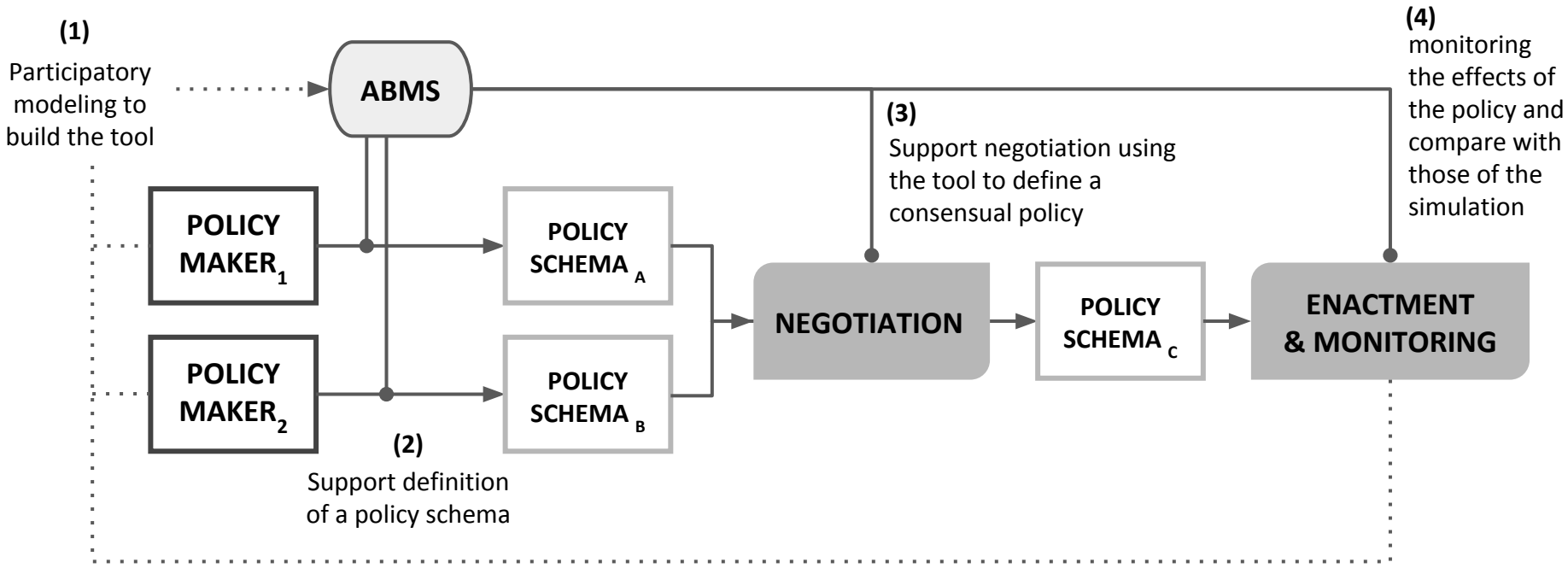




5. Uses of the simulation

- Basis for **eliciting social values** and ensuring value plurality.



6. Conclusions

- **Conclusions:**
  - Understand the consequences of policies by making an explicit link between their values and the instruments and expected outcomes they choose.
  - Explore value-driven policies to see whether they are ***effective*** and ***good*** from a societal perspective [2,3].
  - ABS is a useful tool to test policies, to deliberate and negotiate, and to monitor and verify the world state.
  - The policy simulation model can be reused as a policy design support system.

Thank you

References:

- [1] https://www.theguardian.com/commentisfree/2018/jul/08/observer-view-on-worldwide-scarcity-means-we-should-conserve-water
- [2] O'Brien, K. L. and Wolf, J. (2010), A values-based approach to vulnerability and adaptation to climate change. WIREs Clim Chg, 1: 232-242
- [3] Perry, C.: ABCDE+F: A framework for thinking about water resources management. Water International 38(1), 95–107 (2013)
- [4] Noriega, P., Padget, J., Verhagen, H., d'Inverno, M.: Towards a framework for socio-cognitive technical systems. In: Ghose, A., Oren, N., Telang, P., Thangarajah, J. (eds.) Coordination, Organizations, Institutions, and Norms in Agent Systems X. pp. 164–181. Lecture Notes in Computer Science 9372, Springer (2015)